NEW SIPHONAPTERA

BY DR. KARL JORDAN.

(With text-figs. 1–46.)

THE descriptions here published must be regarded as preliminary, being restricted to some of the principal characteristics by which the various new genera, species, and subspecies are distinguished. A fuller account is reserved for a *Monograph of the Siphonaptera*, which is in course of preparation.

In order to render that Monograph more complete, and therefore more useful for the students of tropical diseases, it is most desirable that we receive further material of fleas from all countries, but most particularly from the tropics and subtropics. The collection of the late Hon. N. Charles Rothschild, which now belongs to the British Museum, will still remain for some time in its old quarters at the Zoological Museum, Tring, and any specimens sent to us, either as a gift or on the terms which the late Hon. N. C. Rothschild used to offer, will be incorporated in that collection.

1. **Hectopsylla stomis** spec. nov.

♀. Frons without angle between oral angle and occiput. Genal process long and narrow. Hindmargin of occiput without lateral lobe. Maxilla as short as in *H. psittaci*. Metepimerum sinuate below posterior dorsal angle (text-fig. 1), which projects as an obtuse triangular lobe and is not curved downwards. Segment V of all tarsi with 4 lateral spiniform bristles on each side, but usually (type) the fourth bristle missing on one side. Anal tergite plus pygidium larger than in the other known species, the patch of 8 sensory pits being laterally placed beyond middle of this segment.

Length: ♀ 1·8–2·3 mm.

Hab. Argentina: Canada Mariano, Buenos Aires, xii.1912 (Miss Runnacles), on birds, and Bahia Blanca, i.1911 (E. Weiske), on *Mephitis*; a small series.

2. **Echidnophaga tarda** spec. nov.

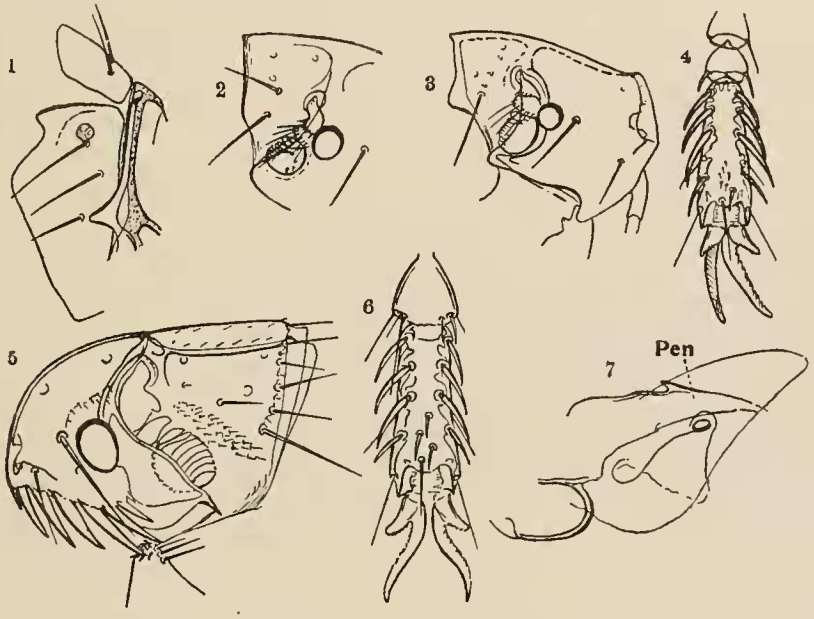
♀. Between *E. gallinaceus* Westw. 1875 and *E. bradyta* J. & R. 1906. As large as *E. bradyta*. Occiput as in *E. gallinaceus* with 2 strong bristles above antennal groove, 1 median, 1 subapical; hindmargin slightly widened below middle, but without a distinct lobe. Genal lobe triangular, directed backwards; apex of genal process broad, rounded off (text-fig. 2). Segment I of maxillary palpus longer than II and IV. Pronotum with 5 bristles on each side. On metepimerum a row of 5 bristles. Abdominal tergite I with 2 bristles on each side, II to VII with 1. Stigmata larger than in ♀ of *E. gallinaceus*; vertical diameter of stigma-cavity of VIII longer than hindtarsal segment II. Bristles on tergite VIII more numerous than in *E. gallinaceus*, 20 or more on each side. On inner side of hindcoxa near middle of posterior margin 1 or 2 long thin bristles. On inner side of hindfemur a row of 5 to 8. Hindtarsal segment IV longer than broad.

Hab. Abyssinia: Addis Abeba (Baron M. de Rothschild), on *Hyaena* and *Felis manicata*; 2 ♀♀

3. **Echidnophaga perilis** spec. nov.

♀. Head longer than in *E. gallinaceus* (text-fig. 3); occiput with 1 long bristle. Metepimerum with 3 or 4 bristles. Tarsal segment V larger than in *E. gallinaceus*, in hindtarsus at least as long as I to IV, V with 2 ventral apical bristles as in *E. gallinaceus*. Abdominal stigmata as in *E. gallinaceus* much smaller than in *E. myrmecobii* J. & R. 1909.

Hab. West Australia: Cranbrook, iii. 1900 (C. J. Tunney), on *Myrmecobius fasciatus*; a small series.



4. **Ctenocephalus arabicus** spec. nov.

♂♀. Near *Ct. rosmarus* Roths. 1907. Genal margin with 1 to 3 spines, which vary very much in size, the spines of the left side of head usually different in size and number from those of the right side. Labial palpi reaching to apex of coxa, being longer than the maxillary palpi. Pronotal comb in ♂ with 9, in ♀ with 11 or 12 spines. On abdominal tergites II to VI a row of 5 bristles on each side; sternites III to VI of ♂ with 2 bristles each side, VII with 3, in ♀ III to VII with 4, one or the other sternite with 3 or 5; VII sometimes with 5; stigmata of II to VII small; tergite VIII of ♀ on outer surface with an apical row of 7 or 8 bristles, preceded by 4 to 6 bristles, at apical margin 2, rarely 1, on inside 4 to 6. Fifth segment of foretarsus with 5 ventral spiniform bristles, in ♂ and one of the ♀♀ this segment in mid- and hindtarsus with 4 such spines (text-fig. 6), in the other ♀♀ with 5.

Hab. Yemen, Arabia: Wasil, on *Procavia syriaca jayakari*, ii. 1913 (G. W. Bury); 1 ♂, 4 ♀♀.

5. **Ctenocephalus crataepus** spec. nov.

♂♀. Near *Ct. craterus* Jord. & Roths. 1913. Frons broader, more evenly convex. Spines of genal comb shorter, the first spine quite small. Labial palpus reaching to or near apex of forecoxa. Second segment of maxillary palpus half as long again as first (in *Ct. craterus* about as long as first). Comb of pronotum with 14 spines, rarely 15, inclusive of the small ventral spine each side. Stigmata of abdominal tergites II to VII small; on each side of these tergites a row of 5 bristles; sternites III to VII with 2 bristles on each side, tergite VIII of ♀ with an apical row of 7 to 11, preceded by 2 or 3 bristles, at apex 2, on inner side a row of 5 or 6. Fifth segment of all tarsi larger than in any other known species of this genus, in foretarsus as long as or longer than II to IV together, in midtarsus about as long as I and II together, in hindtarsus about twice as long as III; IV in all tarsi broader than long; on ventral surface of V in all tarsi 2 spiniform bristles and some very small hairs, third lateral bristle placed at one-third (text-fig. 4).

Hab. Kenya Colony: Rumruti, from *Xerus erythropus* and *Epimys jacksoni*, x.–xi. 1910 (R. Kemp); a small series of both sexes.

6. **Ctenocephalus connatus** spec. nov.

♂♀. Head (text-fig. 5, ♂) as strongly rounded as in *Ct. canis*. Above antennal groove the median bristle smaller than in *Ct. canis* and *Ct. felis*, the anterior one minute or absent. Labial palpus reaching beyond two-thirds of forecoxa, usually to three-fourths. Praeoral tuber reduced, at least in ♂, sometimes also in ♀, often obsolescent in ♂. Above antennal groove in ♂ the small hairs arranged in three or even four irregular rows, these hairs being more numerous than in any other known species of this genus.

Thorax and abdomen with fewer bristles than in *Ct. canis*, the new species more or less agreeing therein with *Ct. felis*. Stigmata of abdominal tergites II to VI small, much smaller than in either *Ct. canis* or *Ct. felis* (the stigmata are larger in *Ct. canis* than in any other species of *Ctenocephalus*). On abdominal sternites III to VI of ♀ 3 or 4 bristles on each side (not 2), VII with 2, tergite VIII with an apical row of 9 to 11, preceded by 2 or 3, at apical margin 2, on inside 5 or 6. On outer surface of first hindtarsal segment 1 or 2 or no bristles; in ♂ (not in ♀) on ventral surface of foretarsal segment V 5 thick spiniform bristles, in the other tarsi only 2 as in all tarsi of *Ct. canis* and *Ct. felis*. Manubrium of clasper of ♂ widened at apex as in *Ct. canis*.

Length: ♂ 1·6–2·2 mm.; ♀ 2·1–3·2 mm.

Hab. South Africa: Deelfontein (*type*) from *Zorilla striata*, *Herpestes badius*, *Erinaceus europaeus*, and *Pedetes caffer* (C. H. B. Grant); Bothaville, from *Xerus capensis* and *Cynictes penicillata* (G. A. H. Bedford); Grahamstown, from *Suricata suricata* (R. Graham, submitted to me by Dr. J. Waterston); a series.—Tanganyika Territory: Vishoro, off *Lepus* (A. Loveridge); 1 ♂.

7. **Ctenocephalus felis strongylus** subsp. nov.

♂♀. Like European *Ct. felis*, but the frons more rounded, in typical ♂♂ nearly as short as in *Ct. canis*.

We have a few true *Ct. felis* and *Ct. canis* from South and East Africa, no doubt introduced; all the other specimens from Africa south of the Sahara, so

far as they do not belong to any of the species described above or to *Ct. craterus* and *Ct. rosmarus*, we treat as being *Ct. felis strongylus*. Specimens with strongly rounded head might be mistaken for *Ct. canis*, but they differ from *Ct. canis* like the more long-headed specimens in the smaller number of bristles on body and legs, the metepisternum bearing 2 bristles, the abdominal tergites a row of 5 on each side, and the tibiae having between the large median bristles and the apical ones only one dorsal notch with a stout bristle; moreover, the stigmata of the abdominal segments II to VI are smaller than in *Ct. canis*, and in the ♂ the manubrium of the clasper is apically less widened, and the large flap of the clasper bears fewer bristles on the outer surface and one or two more at the ventral margin. We observe a good deal of variation in these African *Ct. felis*, but the specimens do not fall into definite groups.

Type from Voi, Kenya Colony, off *Canis lateralis* (R. Kemp).

A large number of specimens from many places from French West Africa and the Sudan to South Africa, off many different hosts.

8. **Ctenocephalus felis orientis** subsp. nov.

♂♀. Like round-headed specimens of *Ct. felis strongylus*. In ♂ abdominal tergite VII usually with a row of 5 bristles on each side and sternite VIII with a row of 4, rarely 3, sometimes 5, besides 1 or 2 bristles placed in front of the row. In ♀ above antennal groove from 2 to 8 small hairs (recalling the more numerous small hairs present in ♂), these hairs not found in the ♀♀ of any other species of *Ctenocephalus* except very occasionally in ♀ of *Ct. canis*.

Type from Peradeniya, Ceylon, off *Loris gracilis* (E. E. Green).

Evidently occurs throughout the Oriental Region, excepting Australia; known to us from Ceylon, India, Burma, Malay Peninsula, Sumatra, Pulo Bali (off west coast of Sumatra), Philippines, Rook I., and Admiralty Is.

From Australia and North and South America we have only *Ctenocephalus canis* and *Ct. felis*, which, together with *Pulex irritans*, probably occur in all places where Europeans have settled.

Centetipsylla gen. nov.

♂♀. Near *Archaeopsylla*; two genal spines placed as in *A. erinacei*. Both sexes with a close-set row of thick short supra-antennal spiniform bristles. Labial palpus short, barely reaching to apex of third segment of maxillary palpus, consisting of four segments. Propleurum dorsally truncate-sinuate. Interior vertical rod of mesopleura joining anterior margin at upper angle, not being confluent with anterior margin before reaching upper angle. Metepisternum well separated from metasternum. Oblique (pale) suture of mesocoxa complete, not interrupted in centre; furcation of internal rods of midcoxa in middle, i.e. much lower down than in *Archaeopsylla* and *Ctenocephalus*. Basal abdominal sternite with lateral bristles.

One species, *C. madagascariensis* Roths. 1900 (as *Pulex*).

9. **Xenopsylla hamula** spec. nov.

Close to *X. brasiliensis* Baker 1904. Subbasal ventral tooth of hindfemur obsolete or barely indicated.

♂. Abdominal sternites III to VII with 2 bristles on each side. Sternite

IX not rounded-dilated at apex, but obtusely acuminate. Distal portion of penis-sheath with a prominent tooth on dorsal side (text-fig. 7).

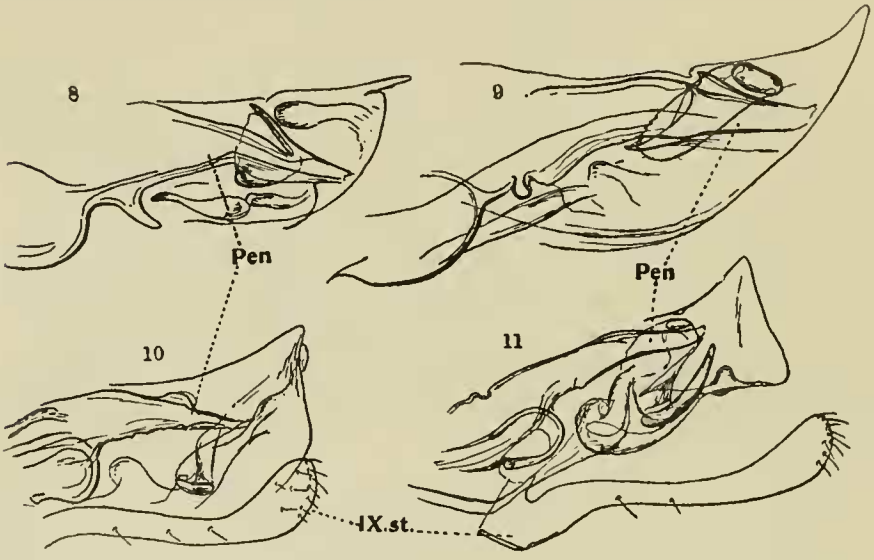
♀. Abdominal sternites III to VI with 3 bristles on each side, on VII 2, occasionally with an additional bristle towards base.

Hab. South Africa: Grahamstown, ix.1913, from *Graphiurus murinus* (R. Graham); a series.

10. **Xenopsylla versuta** spec. nov.

Near *X. nesiotes* Roths. 1908. Bristles less numerous, tail-end of ♂ different.

♂. On sternite VIII 8 to 11 bristles each side. Outer flap P′ of clasper much smaller than in *X. nesiotes*, with 5 bristles. Ventral arm of sternite IX as in *X. nesiotes*, narrower. Neck of ejaculatory duct (text-fig. 8) with dorsal and ventral tooth nearer apex, and the dorsal tooth much longer, ventral projection placed near vesicle also longer; paramere of penis nearly as in *X. nubicus*, the dorsal margin being continued distad as a semi-detached thorn-like process.



♀. On the two sides together of sternite VII only 6 bristles, with or without one small bristle in front of the row. On each side of tergite VIII 6 to 10 lateral bristles, an apical row of 11 or 12 on outer side, and one of 9 to 11 on inside. Spermatheca as in *X. cheopis*, but smaller.

Length: ♂ 1·9–2·0 mm., ♀ 2·3 mm.

Hab. Angola: Benguella, on *Funisciurus*, v.1906 (Dr. W. J. Ansorge); a small series.

11. **Xenopsylla vexabilis** spec. nov.

Close to *X. nesiotes* Roths. 1908, recognised by the tail-end.

♂. On sternite VIII 12 or 13 bristles each side, last one nearer apical margin than in *X. versuta*. Processes of clasper smaller than in *X. nesiotes*, P′ three times as long as broad, with 5 or 6 bristles; manubrium longer than hindtarsal seg-

ments II to IV together. Dorsal tooth of ejaculatory duct small, ventral one long (text-fig. 9), both as far from apex as in *X. nesiotes*, ventrally near vesicle a short (transverse) tubercle concave on distal side and projecting ventrad ; paramere as in *X. nesiotes* gradually narrowed obliquely upward, without the semi-detached dorsal thorn-like process of *X. versuta*, *X. nubicus*, *X. astia*, etc.

♀. Abdominal sternite VII, on the two sides together, with a row of 10 bristles, there being no additional bristles in front of the row. On outer surface of tergite VIII 8 to 10 lateral bristles, and a row of 10, on inside also a row of 10. Spermatheca nearly as in *X. nesiotes*, variable.

Length : ♂ (contracted) 1·4 mm., ♀ 2·2 mm.

Hab. South Australia : Franklin Is., on *Leporillus jonesi* (Prof. Wood Jones), sent to us by Dr. E. Ferguson ; one pair.

12. **Xenopsylla humilis** spec. nov.

Very close to *X. niloticus*, which it possibly represents in East Africa.

♂. Outer process of clasper shorter than segment III of hindtarsus ; ventral arm of sternite IX apically dilated (text-fig. 10), and medianly narrower than in *X. niloticus*. Lateral lobe of paramere of penis, which lobe is proximally subcylindrical and projects frontad, strongly anguliform.

♀. Basal abdominal sternite without lateral bristles, or at most with a single small one.

Hab. Voi, Kenia Colony, iv. 1910 (R. Kemp), on *Gerbillus* (*Tatera*) *mombasae* ; 2♂♂, 4♀♀.

13. **Xenopsylla difficilis** spec. nov.

Likewise close to *X. niloticus*.

♂. With fewer bristles than in *X. niloticus* on abdominal tergite VII and sternites III to VIII. Outer process of clasper longer than segment III of hindtarsus, often half the length of segment I. Ventral arm of sternite IX as in *X. humilis* apically dilated. Apical portion of ejaculatory duct without the dorsal tuberculiform swelling found in *X. niloticus*, *X. humilis*, and *X. debilis* ; lateral lobe of paramere less curved than in *X. humilis*, on inside of it a well-defined, strongly chitinised, slightly upcurved, thorn-like sclerite (text-fig. 11).

♀. Basal abdominal sternite with 6 to 9 bristles on the two sides together, and in addition on each side 2 to 4 long lateral bristles. Sternite VII on the two sides together with 10 to 13 bristles (in *X. niloticus* 16 to 28, in *X. humilis* 14 to 19) ; apical row on outer surface of tergite VIII containing 6 or 7, usually 7 bristles, the row of inner side 7, less often 8.

Hab. Kenia Colony : Nyama Nyango, Eusso Nyiro, ii. 1911 (R. Kemp), *type*, on *Gerbillus* (*Tatera*) *nigricaudus nyama* ; also from Kilimandjaro, v. 1910, on same host (R. Kemp) ; a series.

14. **Xenopsylla debilis** spec. nov.

♂. *Xenopsylla niloticus* Rothschild, *Proc. Ent. Soc. Lond.* p. 147. fig. 10 (1917) (error of identif.).

♂♀. Close to *X. niloticus*, but undoubtedly distinct from it, not an individual aberration. Second segment of maxillary palpus half as long again as first. Eye quite small, narrower than in the figure quoted, which is diagrammatical. Basal abdominal sternite in both sexes with only 2 ventral bristles,

1 each side. Segments III to V of foretarsus broader. In ♂ the eighth abdominal sternite bears on each side fewer than 10 bristles, and the ventral arm of the ninth sternite is more gradually widened and its widened distal end longer. In ♀ the eighth tergite has 10 bristles on the outside, and a marginal row of 6 or 5 on the inside. The head of the spermatheca is practically globular, being one-sixth longer than high ; in *X. niloticus* the head of the spermatheca is somewhat oblique, ovate, higher than long.

Length : ♂ 1·3 –1·4 mm., ♀ 1·9 mm.

Hab. East Africa : Kilimandjaro, v.1910, and Nyama Nyango, Eusso Nyiro, ii.1911 (*type*), on *Gerbillus* (*Tatera*) *nigricaudus nyama* ; Aberdare Mts., Kenia, iii.1910, on *Oenomys* ; 3 ♂♂, 1♀, collected by R. Kemp.

Procaviopsylla gen. nov.

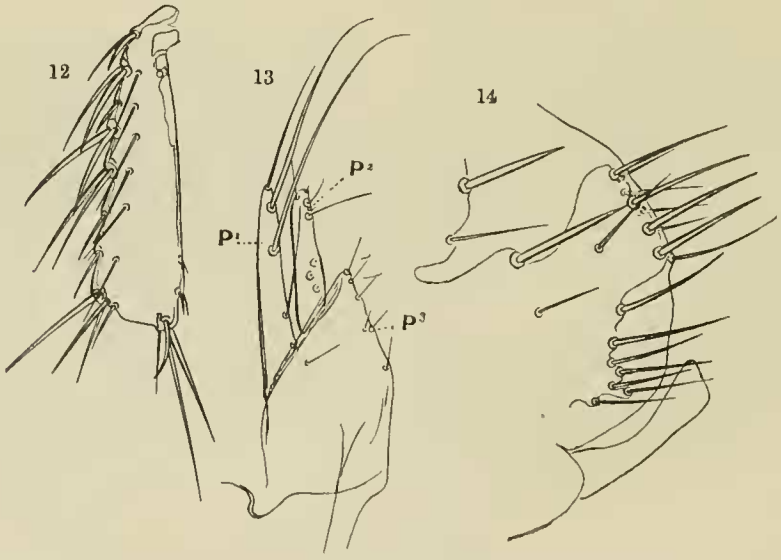
♂♀. Differs from *Xenopsylla* in the hindcoxa being pyriform, with the hind-margin gradually slanting from middle to apex, and the comb on innerside placed much nearer apex than in *Xenopsylla*.

Genotype : *P. isidis* Roths. 1903.

Here also belong *P. creusae* Roths. 1904, *P. convergens* J. & R. 1908, and *P. procaviae* Fox 1914.

15. **Procaviopsylla angolensis** spec. nov.

♂♀. Near *P. creusae* Roths. 1904. Proboscis as long as (♂) or longer than (♀) maxillary palpus. Hindtibia with 8 dorsal notches inclusive of apical one (text-fig. 12). Upper process of clasper of ♂ reaching close to apex of lower process.



Abdominal tergite VII of ♀ less strongly chitinised at dorsal apical angle than in *P. creusae*, this angle not projecting ; on side of tergite VIII of ♀ 2 long bristles and (on one side of our only ♀) one short one, the apical row containing 10 or 11 bristles.

Hab. Benguella, Angola, ix.1905 (received from Messrs. O. E. Janson & Sons), on *Procavia* ; 4 ♂♂, 1 ♀.

Synosternus gen. nov.

Differs from *Xenopsylla* in the metepisternum being entirely united with the metasternum.

Genotype : *S. pallidus* Tasch. 1880.

Here also belong *S. somalicus* J. & R. 1908, *S. longispinus* Wagn. 1893, *S. caffer* J. & R. 1923, and *S. cleopatrae* Roths. 1903.

16. **Pariodontis subjugis** spec. nov.

♂♀. Like *P. riggenbachi* Roths. 1904, but end-segment of proboscis little longer than penultimate one, hindtarsal segment I less than twice as long as V, hindfemur ventrally much less evenly convex than in *P. riggenbachi* ; ♀ with some small bristles above antennal groove ; outer process P′ of clasper of ♂ (text-fig. 13) with a row of 3 bristles from two-thirds to apex, first and second long, third smaller ; in ♀ the row on tergite VIII ventrally irregular (text-fig. 14), and on the side of this segment 4 or 5 bristles ; stylet of ♀ shorter than in *P. riggenbachi*.

Hab. Malay Peninsula : Mbu Gomback, Selangor, on *Hystrix longicaudata* (C. Strickland) ; 1 ♂, 2 ♀♀.

Cediopsylla gen. nov.

Like *Spilopsyllus*, but the labial palpus consists of four segments instead of two.

Genotype : species identified as *C. simplex* Baker 1895.

17. **Cediopsylla inaequalis interrupta** subsp. nov.

♂♀. Genal comb usually with 6 or 7 spines, sometimes 5. Row of long bristles at ventral margin of ♂-clasper divided into a proximal group of 4 to 6 and a distal group of 2 or 3.

Hab. California : Palo Alto, on fox (ex coll. Stanford University) ; San Francisco, on *Lepus bachmanni* (Carroll Fox) ; Claremont, on *Lepus* (C. Baker) ; a series.

18. **Hoplopsyllus glacialis profugus** subsp. nov.

♂. Close to *H. gl. lynx* Baker 1904 ; finger-like process of flap of clasper somewhat broader ; sides of eighth abdominal sternite with 8 or 9 bristles ; comb of hindcoxa containing 11 or 12 spines.

Hab. Near Djarkent, Semitchenskoi, Eastern Turkestan (W. Rückbeil), on *Putorius ermineus* ; 2 ♂♂.

An interesting discovery, the other known forms of this genus occurring in North and Central America and Greenland.

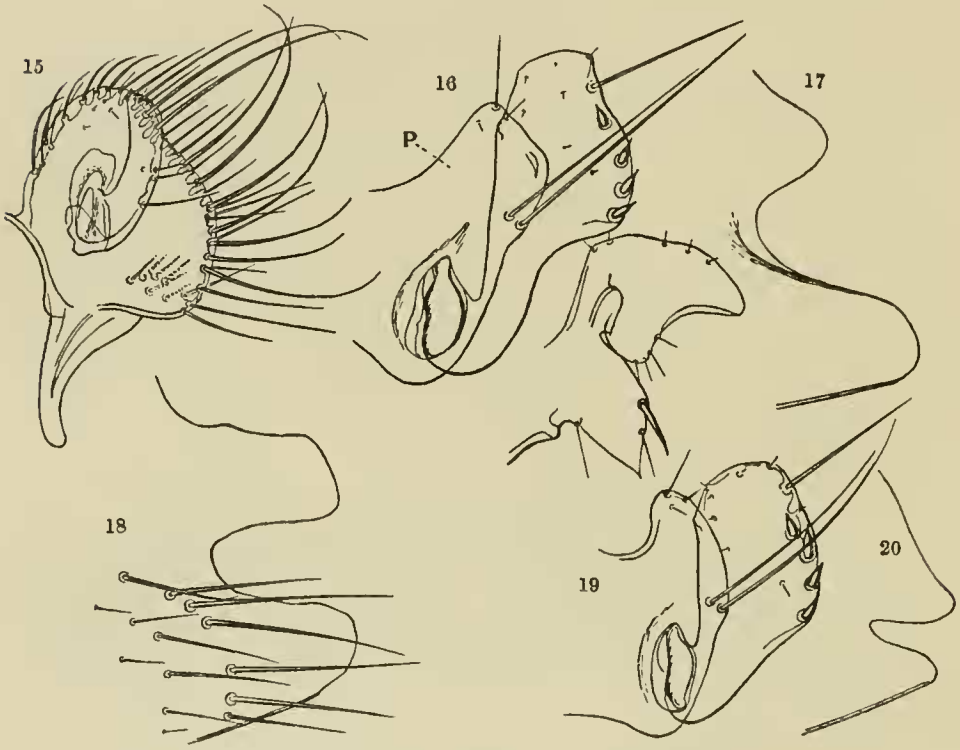
19. **Trichopsylla matina** spec. nov.

Agrees with *T. rothschildi* Kohaut 1903 in the number of bristles on the inner side of the hindcoxa and on the mid- and hindfemora being reduced.

♂. Clasper (text-fig. 15) nearly as in *T. trichosa* Kohaut 1903, but broader, its posterior margin with more bristles and less incurved below apex ; exopodite longer, its base below middle of clasper. Sternite IX with two apical bristles, 1 long, the other somewhat shorter. Paramere with long, conical, lateral process and a large apical lobe which ends with a short dorsal hook.

♀. Sternite VII as in *T. rothschildi* with prominent triangular ventral lateral lobe. Tergite VIII with a vertical row of about 12 bristles from above stigma, and at apical margin on outer side about 12 to 16 bristles, no bristles at and near middle of ventral margin.

Hab. Pyrenees : Cauterets (J. Mousquès), on *Mustela martes* ; a series.



20. **Ceratophyllus waterstoni** nom. nov.

Ceratophyllus rothschildi Waterston, *Proc. Roy. Phys. Soc. Edinb.* xviii. 2. p. 80, text-figs. 1–6 (1910), nec *Ceratophyllus rothschildi* Rainbow, *Rec. Austral. Mus.* vi. 2, p. 103, figs. 27, 28 (1905).

We have much pleasure in renaming this species after its discoverer.

21. **Ceratophyllus caedens** spec. nov.

Similar to *C. sexdentatus* Baker 1904, and *C. nepos* Roths. 1905.

♂. Process P of clasper broad (text-fig. 16), subtruncate ; exopodite F with 4 or 5 short spines, usually 4, first spine above middle, proximal half of F narrow, greatest width at first or second spine ; proximal ventral lobe L of sternite IX

triangular, sharply pointed ; apical portion of IX st. dorsally rounded-elbowed, ventrally incurved ; membranous apical portion of sternite VIII fringed.

♀. Sternite VII (text-fig. 17) deeply sinuate, upper lobe shorter than lower, but very variable in width and length, on the two sides together 16 to 19 bristles.

Length : ♂ 2·0 mm., ♀ 2·3–2·8 mm.

Hab. Alberta : Banff, ix. 1915, on *Mustela americana* (Messrs. Mackay & Dippie) ; a series.

22. **Ceratophyllus latens** spec. nov.

♂. Like the previous, but process P of clasper (text-figs. 19) narrower, subacuminate, on anterior side deeply incurved, on posterior side rounded ; exopodite F more gradually widened.

♀. Sinus of sternite VII (text-fig. 20) narrow, the lobe above the sinus a little longer than the one below it, recalling *C. aeger* Roths. 1905, but in the latter species the frons bears two rows of bristles, the comb consists (in ♀) of 19 or more spines (in the new species only 16), and in *C. aeger* the bristles on the fore-coxa are also more numerous than in *C. latens*.

Length : ♂ 2·0 mm., ♀ 2·7 mm.

Hab. California : Santa Cruz Co., vii. 1900, on Gray Squirrel (Ehrhorn) ; 1♂, 2 ♀♀ ex coll. Baker.

23. **Ceratophyllus robustus** spec. nov.

♀. Near *C. enoplus* Roths. 1909, from California. Sternite VII deeply sinuate, the lobes equal in length, upper one broad, truncate (text-fig. 18) ; on the two sides together 28 to 33 bristles in our four specimens. On tergite VIII 4 or 5 long bristles and 1 to 3 short ones below stigma, and more than 20 bristles on lower half, inclusive of apical bristles, on inside 3 or 4 submarginal ones.

Length : 4·0–4·3 mm.

Hab. Arizona : White R., Cooley, vi. 1920 (H. H. Kimball), type ; 2 ♀♀, host not given.——New Mexico : Riti de los Frigoles, viii.1910 (Professor J. Henderson), on *Sciurus aberti* ; 2 ♀♀ received from Dr. T. D. A. Cockerell.

The ♂ of this species I expect to have numerous long bristles ventrally on the eighth abdominal tergite, as in the case of *C. pseudarctomys* Baker 1904, *C. acasti* Roths. 1905, and *C. enoplus* Roths. 1909. The ♂♂ of the former two species have a mane of long bristles on the thorax, while *C. enoplus* is without it.

24. **Ceratophyllus piger** spec. nov.

Near *C. infestus* Roths. 1908.

♂. Process P of clasper (text-fig. 21) as short as in *C. infestus*, deeply incurved on distal side, with one long bristle above acetabulum ; exopodite F recalling *C. argus* Roths. 1908, almost linear and straight, six times as long as broad, at three-fourths of posterior margin a bristle which is about one-fourth the length of F, at posterior apical angle a much longer bristle, between the two and at apical margin several small ones.

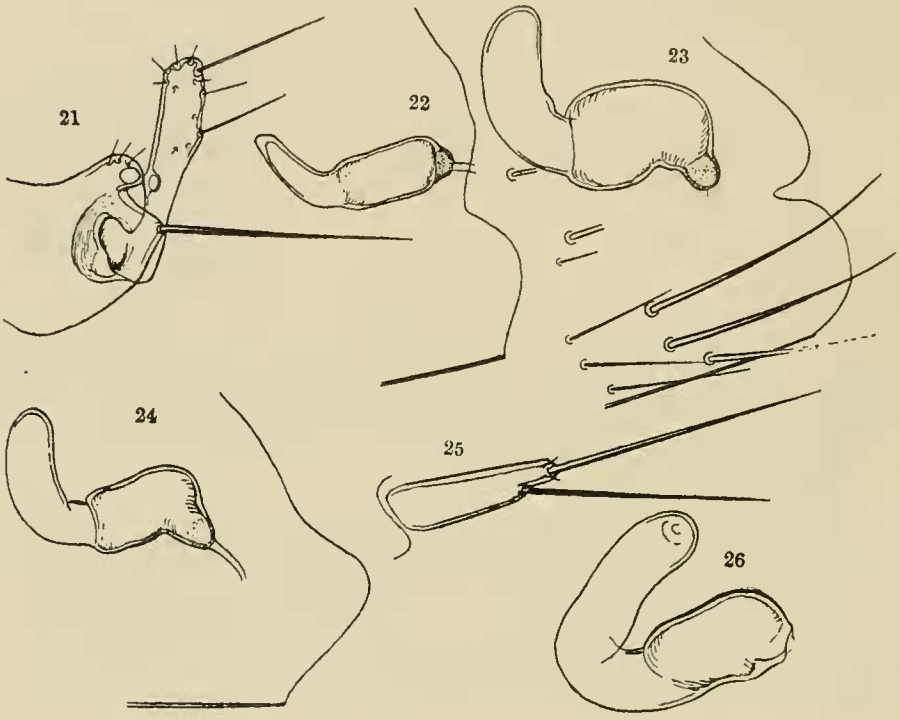
♀. Sternite VII (text-fig. 22) with a shallow sinus in middle of side, the margin less projecting above the sinus than below it ; bristles less numerous than in *C. infestus*, also on tergite VIII. Spermatheca of nearly the same shape as in *C. infestus*, but tail shorter.

Length : ♂ 2·8 mm., ♀ 3·1 mm.

Hab. Uganda: Mabira Forest, xi.1919 (R. A. Dummer), on *Funisciurus* spec.; one pair.

25. **Ceratophyllus consobrinus** spec. nov.

♀. Likewise near *C. infestus* Roths. 1908; as in the previous spec. nov. the bristles on the abdominal sternites and on tergites VIII less numerous. Sternite VII with a small narrow sinus above middle of side (text-fig. 23), both lobes rounded, the upper one small; on the two sides together 20 bristles. On each side of body the widened ventral portion of tergite VIII on outer surface 12 or 13 bristles inclusive of apical ones and the 2 below pygidium, and on inside



4. Spermatheca recalling the South American *Rhopalopsyllus subtilis* J. & R. 1923; its head one-half longer (in a straight line) than broad, tail a little longer, orifice on a rounded projection which is directed obliquely downward.

Length: 2·5 mm. (somewhat contracted).

Hab. Gaboon: Abanga R., x.1907 (Dr. W. J. Ansorge), on "*Sciurus*"; one ♀.

26. **Ceratophyllus notabilis** spec. nov.

♀. Similar to the preceding species, bristles more numerous on sternite VII: on the two sides together 38; this sternite with one rounded lobe, the dorsal margin being strongly oblique (text-fig. 24). Spermatheca as in *C. consobrinus*, but narrower.

Length: 3·4 mm.

Hab. Gaboon: Abanga R., x.1907 (Dr. W. J. Ansorge), on "*Sciurus*"; one ♀.

27. **Ceratophyllus melinus** spec. nov.

♀. Near *C. melis* Curtis 1832. Frons with an anterior row of 6 bristles, occiput with an oblique median row of 3. Proboscis shorter, not reaching beyond trochanter. Pronotal comb dorsally longer than pronotum. Stylet (text-fig. 25) cylindrical, four times as long as wide. On outer surface of tergite VIII from the stigma down altogether 16 or 17 bristles. Spermatheca (text-fig. 26) nearly as in *C. melis*.

Hab. A single ♀ in Mus. Brit., without indication of locality and host, probably Asiatic.

28. **Ceratophyllus phillipsi** spec. nov.

Near *C. fimbriatus* J. & R. 1921, from N.W. India, and *C. agathus* J. & R. 1922, from Sumatra.

♂. Manubrium of clasper longer than internal expansion of tergite IX, its base less broad than in *C. fimbriatus* (the ♂ of *C. agathus* not known). Anterior margin of exopodite F twice as long as process P (text-fig. 27), its ventral angle rounded; at this angle two heavy spiniform bristles, a third similar one at some distance above the pair. Sternite VIII much longer than in *C. fimbriatus*, with a row of minute hairs along ventral margin and 1 smallish bristle, which is nearly twice as far distant from extreme base than the bristle of *C. fimbriatus*.

♀. Sinus of sternite VII rather shallow and broad, the upper lobe triangular, shorter than the lower lobe; which is truncate, with the upper angle rounded. Head of spermatheca globular, nearly as in *C. agathus*, but larger (text-fig. 28).

Length: ♂ 2·7 mm., ♀ 2·9 mm. (♂ extended).

Hab. Ceylon: St. George, Matugama, iii.1923 (W. W. Phillips); one pair.

29. **Ceratophyllus fotus** spec. nov.

Near *C. petiolatus* Baker 1905.

♂. Tergite VIII with a vertical row of 3 or 4 bristles ventrally, without the ventral patch of long bristles obtaining in *C. petiolatus*. Sternite VIII triangular, acuminate (text-fig. 30). Both the process P of the clasper (text-fig. 29) and the exopodite shorter, and the manubrium very much narrower and more pointed, its apex not distinctly turned up. Proximal ventral lobe of sternite IX hardly at all projecting ventrad, its distal angle slightly smaller than 90°, apical lobe shorter and broader than in *C. petiolatus*. Lamina of penis bottle-shaped, symmetrical; paramere truncate, with the ventral corner triangular and projecting a short distance downward.

♀. Proboscis reaching well beyond trochanter. With 3 antepygidial bristles, of which the dorsal one is less than half the length of the central one. Basal abdominal sternite without lateral bristles. Ventral setose area of anal sternite about one-half longer than the stylet. Hindtarsal segment II with only one bristle which reaches beyond IV. Tail of spermatheca as in *C. proximus* Baker 1904 without appendix.

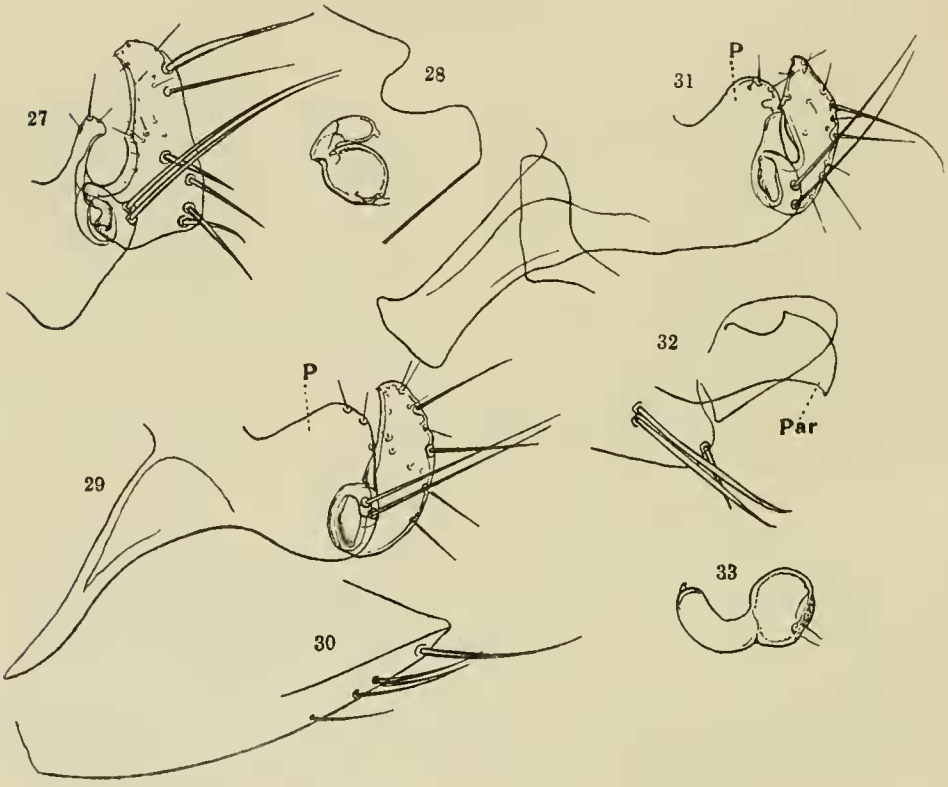
Length: ♂ 2·2 mm., ♀ contracted.

Hab. Colorado Springs, iv.1910 (E. R. Warren), on *Spermophilus 13-lineatus*; one pair.

30. **Ceratophyllus gladiolis** spec. nov.

Near *C. bacchi* Roths. 1905, hindtarsal segment I being as long as II to IV together.

♂. Hindtarsal segment II with 2 slender bristles reaching beyond middle of V, an apical and a subapical bristle of I also long and slender. Process P of clasper (text-fig. 31) evenly rounded ; exopodite longer than in *C. bacchi* ; manubrium broad, straight, truncate. Proximal ventral lobe of sternite IX (text-fig. 32) broad, round, with a strong apical bristle, and on the side 2 or 3 large flattened ones. Apical margin of paramere (Par) rounded, the dorsal and ventral angles acute.



♀. Longest bristle of hindtarsal segment II reaching beyond or to middle of V, the second longest bristle barely extending to apex of III. Head of spermatheca almost globular, tail short, scarcely at all dilated at end, with a small apical appendix (text-fig. 33).

Length : ♂ 1·7 mm., ♀ 2·4 mm.

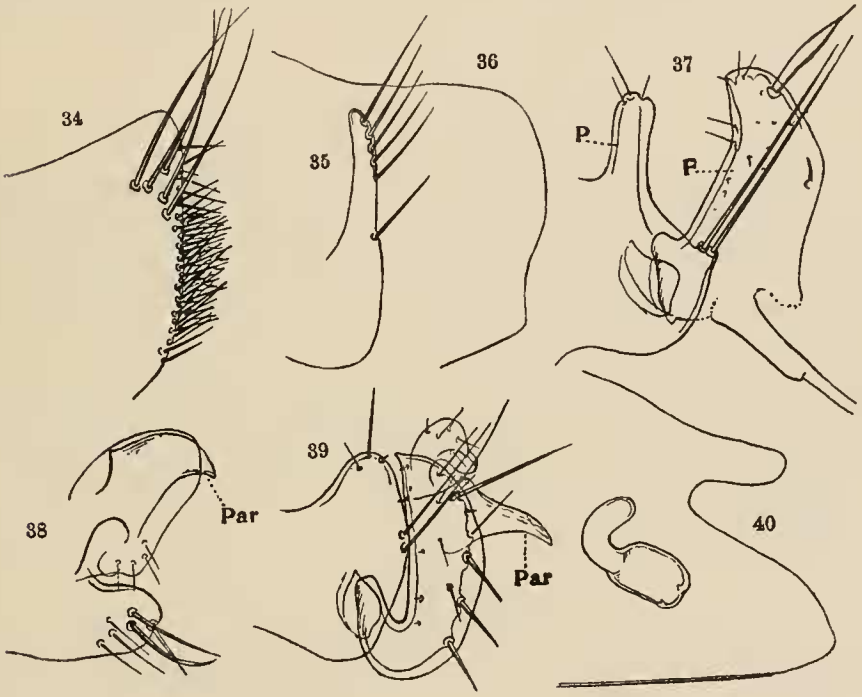
Hab. California : St. Diego, iii.1914 (F. Stevens), on *Citellus turdicaudatus, type* ; San Francisco, iii.1911 (G. W. McCoy), on *Perognathus* and *Tamias* kept together in a cage.

31. **Ceratophyllus pansus** spec. nov.

Also close to *C. bacchi* Roths. 1905.

♂. Large bristle of exopodite longer and thicker than in the preceding species, placed farther upwards, between it and base 5 marginal bristles, all shorter than the 3 largish ones of *C. gladiolis*. The two flattened bristles on proximal ventral lobe of sternite IX much closer to the apical bristle and shorter, proximally of them several small bristles. Paramere much more asymmetrical, the ventral angle projecting distad (text-fig. 38).

Hab. Arizona: Paradise, xi.1913 (O. C. Duffner), on *Citellus* and *Mephitis*; a series.



32. **Ceratophyllus howelli** spec. nov.

Close to *C. acamantis* Roths. 1905.

♂. Tergite VIII ventrally almost gradually widened, ventral apical corner gradually produced, rather strongly chitinised, and at the tip rounded (text-fig. 34), on each side of this lobe 4 or 5 long bristles at some distance from the apex, and along the ventral margin very numerous shortish but rather strong bristles to beyond the patch of long ones. Sternite VIII (text-fig. 35) much slenderer than in *C. acamantis*.

♀. Apical margin of sternite VII truncate-rounded (text-fig. 35), subventrally slightly incurved; on this sternite, on the two sides together, a row of 16 bristles and in front of the row 12. Spermatheca as in *C. acamantis*.

Hab. California: Pine City, Mono Co., vii.1922 (A. B. Howell); one pair, the ♂ on *Mustela arizonensis* and the ♀ on *Marmota sierrae*.

33. **Ceratophyllus necopinus** spec. nov.

A most interesting discovery, the species being very close to the Asiatic *C. clarus* J. & R. 1922 and *C. runatus* J. & R. 1923, and like these species occurring on *Ochotona*.

♂. Differs from *C. runatus*, to which the species is nearest, in the exopodite of the clasper being much broader (text-fig. 37), particularly in the lower half; anterior margin of process P very little over half the length of the posterior margin (14 : 26), measured from acetabulum.

♀. Like that sex of *C. runatus*, which varies individually in the size of the spermatheca and the number of bristles on tergite VIII.

Hab. California: Pine City, Mono Co., vii. 1922 (A. B. Howell), on *Ochotona muiri*; one pair.——We are greatly indebted to Mr. A. B. Howell for a most interesting collection of fleas from California.

34. **Ceratophyllus isus** spec. nov.

Close to *C. euphorbi* Roths. 1905.

♂. Near ventral margin of tergite VIII only 2 long bristles. Sternite VIII with 3 long bristles on each side, one behind the other. Exopodite of clasper with the third bristle from below as stout as the first and second (text-fig. 39). Proximal ventral lobe of sternite IX longer and less rounded than in *C. euphorbi*; apical lobe strongly excised ventrally before apex, hook-shaped. Paramere (Par) slenderer than in *C. euphorbi*.

♀. Sternite VII deeply sinuate (text-fig. 40), upper lobe narrow, variable, much shorter than lower lobe, which is rounded-subacuminate. Stylet thrice as long as broad, cylindrical to two-thirds or beyond, with one longish lateral bristle. Upper angle of widened portion of tergite VIII a little projecting.

Length: ♂ 2·3–2·9 mm., ♀ 2·8–3·3 mm.

Hab. Canadian Rocky Mts.: Red Deer R. (A. D. Gregson), on "*Mus*"; a small series.

35. **Ceratophyllus sinomus** spec. nov.

Near *C. telchinum* Roths. 1903, hindtarsal segment I of ♂ as in that species with long slender bristles, and sternite VIII vestigial, without bristles. In ♀ stylet with one lateral bristle, and occiput with a small bristle above long median one.

♂. Process P of clasper (text-fig. 41) broad, of nearly even width, not acuminated; exopodite F triangular, reaching only to apex of P, posterior margin rounded, apex pointed, directed capitad, at lower angle, which is rounded off, a long, stout, straight, sharp spine, from this blackish spine upward a row of 4 stiff bristles, all much thinner than the spine, the lower three also shorter, the upper one longer.

Hab. Arizona: Paradise, xii. 1913 (O. C. Duffner), on "*Mus*"; a series.

36. **Ceratophyllus sibynus** spec. nov.

Nearest to *C. dolens* J. & R. 1914 from Costa Rica.

♂. The lowest bristle of the exopodite replaced by a stout, straight, obtuse, long spine (text-fig. 42); sternite IX at some distance proximally of ventral

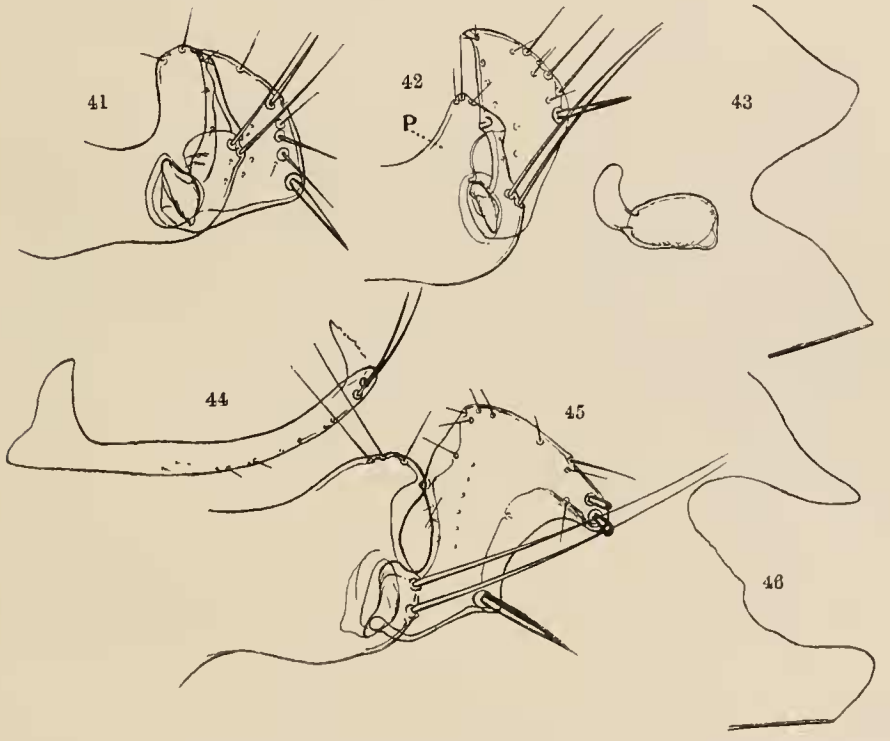
sinus on each side with a cluster of 6 bristles, of which the 3 lateral ones are small, the other 3 ventral, longish, the middle one of them being the longest.

Hab. Arizona: Paradise, xii.1913 (O. C. Duffner), on Skunk; 1 ♂.

37. **Ceratophyllus acerbus** spec. nov.

Near *C. lucifer* Roths. 1905, belonging to a small group of *Ceratophylli* in which the hairy stigma-cavity of tergite VIII is very large.

♀. Above large median bristle of occiput a small one. Three bristles of segment II of antenna extending to near apex of club. Pronotal comb with 19 spines inclusive of the small ventral one of each side. On abdominal tergites three rows of bristles, first row incomplete.



Sternite VII (text-fig. 43) divided by a deep and broad sinus into two triangular lobes of nearly equal size. Stylet with two long lateral bristles. Orifice of spermatheca on a rounded prominence, its head longer than the tail.

Length (abdomen contracted !): ♀ 2·7 mm.

Hab. Canada, on *Tamias striatus*, 1 ♀ received from the late Dr. Gordon Hewitt.

38. **Ceratophyllus diffinis** spec. nov.

A bird-flea, similar to *C. garei* Roths. 1902. As in that species, the denticulated area on the inside of tergite VIII of ♂ narrow, ill-defined, with the teeth not numerous. Also near *C. angulatus* Wahlgr. 1903.

♂. On outer surface of tergite VIII altogether 9 or 10 bristles inclusive of the small ones placed near stigma. Exopodite F of clasper almost as in *C. garei*, its bristles somewhat different (text-fig. 44). Sternite VIII narrow throughout, with 2 long bristles on each side at apex, one behind the other, and a narrow, short, elongate-triangular apical membraneous lobe which is directed dorsad (one each side). Paramere broader than in *C. garei*.

Length : 2·6 mm.

Hab. British Columbia : Okanagan Falls, iv. 1913 (C. Garrett), on *Colymbus holboelli* ; 1 ♂.

39. **Ceratophyllus atrox** spec. nov.

Comb of pronotum with 26 to 29 spines. Stigma-cavity of tergite VIII very large. On metepisternum 5 or 6 bristles, on metepimerum 10 or more. Bristles on outer surfaces of tibiae and tarsi unusually numerous, the hindtibia bearing more than 25 dorso-lateral ones.

♂. Exopodite F of clasper (text-fig. 45) recalling *C. ciliatus* Baker 1904, but much broader and shorter, broadest at apex, posterior margin angulate near middle and here armed with a long, pointed spine, posterior apical angle produced and bearing two short obtuse spines. Ventral arm of sternite IX narrowed basad and apicad, with a ventral row of small bristles from near base, and on each side one large apical bristle ; membranous apical flap broad.

♀. Sternite VII (text-fig. 46) with a very broad and deep sinus, which is deeper above than below, the upper lobe tapering, the lower one broader, truncate-rounded, the margin in middle of sinus angulate, on the two sides together more than 40 bristles. Head of spermatheca half as long again as broad, barrel-shaped, but narrowing towards tail, which is shorter than the head.

Length : ♂♀ 2·8–3·0 mm.

Hab. Canada : Blackfalls, Alberta (A. D. Gregson), on *Mustela* ; 2 ♂♂, 4 ♀♀. Presumably a bird-flea.